

CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

Chapter 4: Environmental Consequences and Chapter 3: Affected Environment form the detailed scientific and analytic basis for the summary comparisons presented in Chapter 2, Section 2.5, Project and Siting Alternatives.

Section 2.5 contains by option the predicted attainment and nonattainment of the two objectives listed in Chapter 1, Section 1.3, Objectives of the Aspen Grove - Westhaven 161-kV Transmission Line - Williamson County, Tennessee, Power Supply Improvement Project. This chapter presents the detailed predicted effects of implementing Alternative 1: Do Not Build Additional Transmission Line (No Action) and Alternative 2: Construct Transmission Line.

4.2. Effects of Alternative 1: Do Not Build Additional Transmission Line (No Action)

Should the proposed TVA transmission line not be built, to meet the current and expected load demands, MTEMC would have to add breakers and circuits as well as build additional transmission lines between the existing substations to accommodate load transfers. An estimated potential of 45 to 50 miles of new transmission lines would be needed to accommodate the load transfers between existing substations. Depending on the routes chosen by MTEMC, the potential for impacts are likely to be similar during construction and operation as the proposed construction of the TVA 161-kV transmission line. It is, however, possible that the potential for impacts for Alternative 1 could be greater than for Alternative 2. This increased potential would result because of the greater number of miles of new low voltage transmission line needed compared to the maximum of 16 miles needed for the higher voltage transmission line proposed in Alternative 2. It is also possible that MTEMC could build the kind of higher voltage transmission line that TVA has proposed. MTEMC has not proposed to do this, but if it did, impacts associated with their construction and operation of the transmission line should be similar to those described in this EA for a TVA-built transmission line.

4.3. Effects of Alternative 2: Construct Transmission Line

4.3.1. Terrestrial Ecology

4.3.1.1. Terrestrial Plants

Each of the transmission line alternatives and route segments would pass through vegetation types that are common and representative of the region. The project area is characterized as residential, open lands, and woodlands. Clearing for the proposed transmission line would result in the removal of less than 10 acres of forest. No rare or uncommon plant communities were identified along any of these segments.

Under Alternative 2: Construct Transmission Line, a new transmission line would cross the Harpeth and possibly the West Harpeth Rivers. As a result, small amounts of wooded riparian habitat would be removed along the river. These areas would be converted and maintained as early successional habitats, resulting in a minor change in the function and structure of this habitat. The removal of these woodlands would result in a small contribution to the fragmentation of riparian habitats. These changes would be localized and minor.

Most of the project lands outside of the river crossings are open habitats; therefore, this proposal would result in minimal and insignificant fragmentation of forests on those lands. The riparian woodlands along the rivers in the project area are generally more intact. In most cases, these sections are very narrow, consist of only marginal strips of trees, and are generally not considered high quality in terms of their plant and animal composition. The removal of these woodlands would result in only a small contribution to the fragmentation of riparian habitats. These changes would be localized and minor.

Due to the existing nature of the project lands and the small amount of woodlands that would be disturbed, this proposal would result in very localized and insignificant effects to the terrestrial ecology of the area. Overall, this proposal would result in an insignificant impact on the vegetation of the region.

4.3.1.2. Invasive Plant Species

Because of the previous level of disturbance to the native plant communities along the proposed transmission line routes, no impacts to such communities from the introduction or spread of invasive terrestrial plants are anticipated as a result of the proposed activities.

4.3.1.3. Terrestrial Animals

Although the majority of the proposed routes consist of relatively open habitats, some woodland habitats occur near streams and river crossings. Construction of the transmission line would remove some of these woodland habitats. Clearing would result in minimal habitat fragmentation and would slightly increase the percentage of forest edge in the vicinity. Although some species prefer edge habitat, other species could be negatively affected by these habitat changes. Small animals that have relatively small home ranges or habitat area requirements or that require specific structural habitat characteristics may be negatively affected by these conditions. However, these effects are expected to be minimal because of the high amount of habitat fragmentation that already exists along the proposed routes. The proposed action would not significantly affect the population status of invasive terrestrial animals or migratory birds in the project area.

Construction of the transmission line would disturb some wildlife habitat and would likely displace, or perhaps destroy, some small animals that occur along the route. Because the majority of these areas have been disturbed by previous land use activities and because the wildlife habitats that occur along the proposed routes are common from a state or regional perspective, impacts to terrestrial animals and these habitats would be insignificant.

The alternative route segments differ little in their potential impacts on terrestrial animals. The Main Corridor, North Mack Hatcher, and South Mack Hatcher Alternatives, as well as Alternative Route Segments B and D, would involve several river crossings and the removal of riparian woodlands from within the right-of-way. The selection of Alternative Route

Segment A would have fewer river crossings, but would closely parallel the Harpeth River necessitating the clearing of a greater area of riparian woodlands along the Harpeth River. The selection of Alternative Route Segment C would have fewer river crossings, but would also closely parallel the West Harpeth River necessitating the clearing of more riparian woodlands along the West Harpeth River. However, selection of any combination of alternative route segments is not expected to result in individual or cumulative adverse effects on terrestrial animal populations in the vicinity.

4.3.2. *Threatened and Endangered Species*

4.3.2.1. Terrestrial Plants

The lands involved in this proposal offer very limited potential habitat for threatened or endangered plants. No occurrences of listed plant species were identified along any of the proposed route alternatives or route segments or at any of the existing or proposed substation sites. Therefore, the implementation of this proposal on any of the alternative routes evaluated is expected to have no effect on threatened or endangered plants.

4.3.2.2. Terrestrial Animals

Potential nesting habitat for the sharp-shinned hawk would be removed by the construction of the proposed transmission line. However, ample nesting habitat for this bird occurs in the surrounding area. Selection of any of the identified alternatives would increase the amount of foraging habitat for sharp-shinned hawks. Any disturbances to this species as a result of the identified alternatives are expected to be minimal and temporary and, therefore, insignificant.

Due to the absence of large tracts of mature forests and because forest habitats in the project area are highly fragmented, cerulean warblers are unlikely to be present. Therefore, no impacts to this species are anticipated as a result of the implementation of any of the alternatives.

If southeastern shrews occur within the project area, some individuals may be destroyed by construction activities as a result of the selection of any of the alternatives. Because this mammal has relatively broad habitat requirements and has a wide geographic distribution, southeastern shrew populations would not be adversely affected by the implementation of any of the alternatives.

No federally listed terrestrial species were identified on or near identified transmission line routes, and no effect on such species is anticipated.

4.3.2.3. Aquatic Animals

No federally listed aquatic animals would be affected by the proposed action. Short-term impacts could potentially occur to state-listed aquatic animals during construction and maintenance activities on this proposed transmission line.

Clearing of riparian vegetation and soil disturbance associated with construction of stream crossings and other construction or maintenance activities could result in runoff entering these waterways. Impacts to Tippecanoe, smallscale, and slenderhead darters would be more likely to occur during the spawning season (late March–late July) for these fishes.

The implementation of erosion control measures as described in 4.3.4 Aquatic Ecology, 4.3.9 Surface Water, and Appendix X during construction and maintenance would help ensure no unacceptable impacts to state-listed aquatic animals. The viability of the local populations of state-listed fish would not be affected.

4.3.3. Wetlands

No wetlands were identified in or adjacent to the original Main Corridor Alternative, Route Segments A, B, C, or D, the North Mack Hatcher and South Mack Hatcher Alternatives; thus, there would be no individual or cumulative impacts on wetland resources because of the construction and maintenance of the proposed transmission line right-of-way.

4.3.4. Aquatic Ecology

Aquatic life could be impacted either directly by alteration of conditions in the streambed or riparian zone or indirectly by runoff from construction and maintenance activities along the route entering aquatic habitats. Although Alternative Route Segment A would have two fewer Harpeth River crossings than any of the other proposed alternatives, it could result in the removal of more riparian vegetation than the eliminated crossings, because of the right-of-way width needed where the route closely follows the Harpeth River. The Harpeth River embankment at the sharp bend (Baugh Bend) near the Rebel Meadows area could be difficult to stabilize if the riparian zone is removed.

Construction of Alternative Route Segment D to the West Franklin area substation sites (Figure 1-3) or either of the Mack Hatcher Alternatives to the Westhaven Substation site would result in less indirect effects related to new right-of-way ground disturbance due to the shorter distance between the substation sites. Direct impact to stream riparian zones would also be much less for these alternatives than for the Main Corridor Alternative and Route Segments A, B, and C to the Bingham Substation site because of fewer needed stream crossings and less paralleling of streams, particularly the Harpeth and West Harpeth Rivers.

Construction of some of the alternative routes would involve more stream crossings than others. However, regardless of which alternative is chosen the impacts to aquatic life would be insignificant with implementation of the following commitments:

- All intermittent and perennial watercourse crossings would be designated as Level B, Protection of Important Permanent Streams, as outlined in Muncy (1999). This commitment restricts the cutting of trees near permanent streams to those meeting National Electric Safety Code and danger-tree requirements and includes consultation with TVA biologists to minimize further the potential impact of stream crossings.
- Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances or ephemeral streams) and that could be affected by the proposed transmission line route would be protected by standard Best Management Practices (BMPs) as identified in Muncy (1999). These BMPs are designed to minimize erosion and subsequent sedimentation in streams.
- TVA stream bank stabilization experts would implement an erosion control plan to stabilize each watercourse crossing (Appendix X).

- TVA botanists would provide recommendations on planting native, low-growing, deciduous, and/or scrub/shrub vegetation on the stream banks to provide bank stabilization and a certain degree of canopy cover.
- TVA's maintenance organization would be informed that future maintenance activities are to minimize disturbance of any stream bank stabilization components or planted vegetation. In addition, future maintenance/sensitive area projects associated with the proposed transmission line would be reviewed by an aquatic ecologist to help ensure that aquatic life is not impacted by sedimentation due to embankment erosion related to maintenance activities.

The intention of these commitments would be to restore and maintain the riparian vegetation in as near a natural state as practicable, and to better stabilize stream banks prone to erosion. Considering environmental impacts resulting from future construction of housing, businesses, and infrastructure in this rapidly developing area, these commitments would in turn reduce the incremental cumulative impacts associated with this action to short-term, insignificant levels.

Road access to construction sites would be planned and built to minimize erosion and sedimentation effects. If no practicable alternative exists, trees along streams within the proposed transmission line route and adjacent danger trees would be cut; however, their stumps would not be removed and short understory vegetation would be disturbed as little as possible. Maintenance activities along streams would be by mechanical cutting or by selective use of USEPA-registered herbicides. Permanent and temporary stream crossings would comply with appropriate Federal and state permitting requirements as well as any applicable designations and BMPs. Where herbicides are used, these chemicals would be applied following USEPA label restrictions and standard TVA BMPs.

4.3.5. *Managed Areas*

The Spencer Creek Seep Protection Planning Site and the Natchez Trace Parkway are located at least 1.4 miles from the proposed transmission line alternatives and substation sites. No impacts are anticipated to these areas as a result of the construction or maintenance of the line. The proposed action is not expected to affect adversely the segments of the Harpeth River that are classified as a State Scenic River.

4.3.6. *Recreation*

Avoidance of developed recreation facilities along the existing Mack Hatcher Parkway would result in insignificant effects on recreation facilities and activities. The project construction phase could cause some temporary displacement of low-density outdoor recreation activities. However, these impacts would be minor and temporary in nature. The Main Corridor Alternative and Alternative Route Segment C would cross a golf course planned in connection with the Westhaven residential subdivision development and could have some impact on the conceptual plans for the course. Golf courses can, however, be designed to be compatible with transmission line rights-of-way, and this use would not be precluded. The other route alternatives and route segments would not cross the golf course and, therefore, would not affect the conceptual golf course plans. The removal of short stretches of trees in the riparian area and the construction of the transmission line crossings would have a minor visual impact to recreational boaters in the project area;

however, the long-term and cumulative impact of the project on recreation would be insignificant.

4.3.7. Floodplains

The proposed 161-kV transmission line would cross numerous floodplain areas. For compliance with EO 11988, an overhead transmission line and the support structures are considered a repetitive action in the 100-year floodplain. The construction of the support structures for the transmission line would not be expected to result in any increase in flood hazard, either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the rights-of-way would be revegetated where natural vegetation is removed, and the removal of unique vegetation, if any, would be avoided. BMPs would be used during construction activities.

A portion of the existing Aspen Grove Substation is located within the 100-year floodplain and floodway of Spencer Creek. Some TVA equipment may be installed in this substation to facilitate connection of the proposed transmission line. There is no practicable alternative to this installation because the Aspen Grove Substation is the most feasible connection point to the 161-kV system. In order to avoid locating equipment in this substation, a new switching station would have to be built and an additional transmission line on a new right-of-way would have to be constructed. To prevent an increase in flood damages, any new TVA equipment and/or facilities would be located outside of the 100-year floodway, and either located outside of the 100-year floodplain or protected to at least the 100-year flood elevation (650.0 feet above mean sea level). Therefore, this portion of the proposed project would comply with EO 11988.

4.3.8. Groundwater

Two wells and one sinkhole have been identified along the proposed routes by the Mack Hatcher Parkway Extension Draft EIS and Draft Section 4(F) Evaluation (U.S. Department of Transportation and Federal Highway Administration and TDOT, 2004). One well and a sinkhole are located along the north alternate Mack Hatcher Parkway extension right-of-way. The other well is located along the segment of the right-of-way, south of where the north alternate and the south alternate come together. Other sinkholes were suggested by the Draft EIS to be present near the intersection of the preferred route and U.S. Highway 431 in the Rebel Meadows Subdivision. All alternative route segments are in the same geologic setting, and each is just as likely to contaminate groundwater without the use of BMPs as described in Muncy (1999). Construction activities would seek to avoid sinkholes and springs as practicable. However, if sinkholes or springs are encountered and cannot be avoided during construction, BMPs would be used to control sediment infiltration. During revegetation and maintenance activities, fertilizers and herbicides would not be used in areas that flow to sinkholes and springs. With the use of these BMPs, potential impacts on groundwater from this action would be insignificant.

4.3.9. Surface Water

Soil disturbances associated with access roads or other construction activities can potentially result in adverse water quality impacts. Stream bank erosion and sedimentation can clog small streams, increase nutrient inflows, and threaten aquatic life. Removal of the tree canopy along stream crossings can increase water temperatures, algal growth, dissolved oxygen depletion, and adverse impacts to aquatic biota. Improper use of

herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

However, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings would be designed not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there is no practicable alternative. Right-of-way maintenance would employ only USEPA-registered herbicides used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts.

Potential surface water effects from the three alternatives and four optional route segments are expected to be similar. Measures identified in Section 4.3.10 Aquatic Ecology are expected to provide adequate protection for aquatic life found in the streams crossed by the proposed project. The design, implementation, and long-term maintenance of effective construction techniques, erosion control measures, and riparian zone management are expected to result in insignificant surface water effects. No cumulative surface water impacts are anticipated. Minor temporary impacts associated with construction and long-term right-of-way maintenance impacts would be minimized using BMPs. Some of the route alternatives would involve additional crossings of the larger streams and could involve slightly more work near the stream during construction, depending on the degree of stream bank clearing required. With effective erosion control measures, the effect on surface water quality would not be expected to be significantly or measurably different between any of the alternative routes.

4.3.10. Visual

Visual consequences are examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The foreground, middleground, and background viewing distances are described in Section 3.3.10.

Visual/aesthetic impacts from the construction, operation, and maintenance of the new 161-kV transmission line would vary under each of the proposed alternative routes. In each of the alternatives, additional poles and new locations would increase the number of adversely contrasting elements seen in the landscape and would contribute to reduced visual coherence and harmony as well as cumulative visual impacts in the landscape. In order to reduce the visual impacts, the transmission line structures would be painted a dark color, thereby reducing visual contrast from the normal bright steel color typically used.

In the vicinity of the existing Mack Hatcher Parkway, structures along the Main Corridor Alternative would be viewed in the foreground by passing motorists, at the existing golf course, and from an array of commercial and religious developments. Existing steel and wooden poles that currently occupy the northern portion of the right-of-way near the substation would be replaced. Replacement of the poles would utilize existing right-of-way largely with minor clearing involved. Replacement of wood poles with new steel poles

would provide taller structures and would increase the vertical adverse contrast in the foreground. However, there would be potentially fewer poles, and utilizing existing right-of-way would have less of an overall impact than creating a new route.

The Main Corridor Alternative would cross U.S. Highway 431 and continue west near Rebel Meadows crossing the Harpeth River twice in the Baugh Bend area. The proposed transmission line may be seen by some residents of Rebel Meadows Subdivision to the west. In addition, recreational users along the river, as well as motorists along the future extension of Mack Hatcher Parkway, would have views of the proposed transmission lines. These views would be brief and under the lines as seen in the foreground.

Farther to the west, the proposed Main Corridor Alternative, North Mack Hatcher Alternative, and Alternative Route Segments B and D traverse open pastureland. This low, flat-lying area has extensive cultivated lands and could be seen by local residents and motorists up to 0.25 mile, mainly from local minor roads and State Highway 96. Views of the proposed transmission line would be predominately in the middleground (1-4 miles), and from the few homes in the area. The proposed transmission line pole structures may provide some visual contrast with the more horizontal man-made alterations (one- to two-story homes, barns, and small silos). This contrast, however, would be insignificant when viewed from these distances.

Prior to reaching the Bingham Substation site near Leipers Fork, the western section of the Main Corridor Alternative would require five minor crossings of the West Harpeth River. This portion of the route would be seen by motorists along Boyd Mill Pike and several area residents. The new transmission line and structures may be seen in the future by residents and recreation users at a new subdivision and golf course planned near the intersection of Boyd Mill Pike and State Highway 96. These views would be mainly in the foreground and partially obscured by elevation changes and existing vegetation. Views from the West Harpeth River would be minimal due to limited recreational opportunities along this portion of the river. Existing vegetation would obscure long views of the proposed transmission lines and associated structures, particularly in the area closest to the Bingham Substation site that has limited vehicular access. Visual contrast with the existing landscape character in this area would be insignificant.

Alternative Route Segment A may be seen by some residents of Rebel Meadows Subdivision to the west and by recreational users along the river. These views would be in the foreground (within 0.5 mile of the observer) and would be brief due to natural vegetative screening along the riverbank. For residents, views would be mostly between poles and under lines, similar to those currently seen along subdivision access roads. As the transmission line continues to travel south, distances increase and terrain becomes a factor in reducing the vertical profiles of new poles. The proposed transmission line poles and structures along Del Rio Pike would be visually similar to those currently seen along this section of road.

Alternative Route Segment C would be seen by motorists along Boyd Mill Pike in the vicinity of White Cemetery. These views would be brief because of differences in elevation and natural vegetative screening. The proposed transmission line would parallel Boyd Mill Pike from Glass Spring and would contribute to the number of poles and structures currently seen in the landscape. However, the proposed transmission line poles would be visually similar to existing structures along the right-of-way. Alternative Route Segment C would terminate near West Harpeth River along the Main Corridor Alternative route north of

Boyd Cemetery. Visual impacts would be similar to those discussed for the Main Corridor Alternative in this area.

Alternative Route Segment D would be seen by motorists along Del Rio Pike near the proposed North Mack Hatcher Parkway extension. These views would be brief due to elevation changes in the right-of-way and heavy vegetation along fence lines.

Impacts to the North Mack Hatcher Alternative along the existing Mack Hatcher Parkway would be similar to those described in the Main Corridor discussion. On the west side of the Harpeth River, the new transmission line would be seen by motorists along Del Rio Pike and the proposed North Mack Hatcher Parkway extension. Similar to Alternative Route Segment D, these views would be brief and in the foreground and middleground. Views of the proposed transmission line would be mostly obscured due to elevation changes along the road right-of-way and heavy vegetation along fence lines. Views of proposed poles and transmission lines along the proposed North Mack Hatcher Parkway extension would be similar to views of structures along the existing Mack Hatcher Parkway. Additional poles and new locations would increase the number of adversely contrasting elements seen in the rural landscape. These incremental changes may not be individually significant, but together would add to existing disruptions to visual coherence and harmony.

Visual impacts due to the construction of the South Mack Hatcher Alternative would be similar to those discussed for the North Mack Hatcher Alternative. Views of the new transmission line would be mainly from local roads for motorists and the proposed South Mack Hatcher Parkway extension.

Operation, construction, and maintenance of the proposed transmission line would be visually insignificant. There may be some minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and material storage areas. These minor visual obtrusions would be temporary until the proposed right-of-way and laydown areas have been restored by using TVA standard BMPs (Muncy, 1999). Therefore, none of the proposed route alternatives or segments, if constructed as shown, would have a significant impact on visual resources.

4.3.11. Cultural Resources

4.3.11.1. Archaeological and Historic Sites

Archaeological surveys of the proposed main corridor and alternative routes were conducted in August and September 2001, May and September 2003, and May 2004. TVA and the Tennessee SHPO agree that 40WM271, situated in the western portion of the main corridor, is the only eligible archaeological site within the proposed project's APE.

Several areas within the main corridor, Alternative Route Segments A, B, and C, were identified as having a high to very high potential for buried archaeological deposits by geomorphologic testing. Should the proposed project utilize one of these sections, then these areas would be subject to further testing for the identification, evaluation, and treatment of eligible archaeological sites pursuant to Section 106 of the NHPA.

Should any eligible archaeological sites be identified or inadvertently discovered during the construction of the proposed project and it is not feasible to avoid these deposits (should pole or structure locations fall within those areas), TVA, in consultation with the SHPO and

other consulting parties, would implement the following measures to avoid any adverse effects.

- If at all feasible, no poles or structures would be located within the boundaries of the identified or inadvertently discovered archaeological site.
- If any eligible identified or inadvertently discovered archaeological sites would be traversed by heavy equipment, low ground-pressure-type equipment would be used when soil conditions are dry and firm.
- If avoidance is not feasible, these areas would be subject to further evaluation and TVA, in consultation with the Tennessee SHPO and other consulting parties, would develop and implement a treatment plan for archaeological data recovery for those portions of the site that would be adversely affected under the terms of a Memorandum of Agreement (MOA) pursuant to Section 106 of the NHPA.

Other than 40WM271, no other archaeological sites currently listed or eligible for listing in the NRHP were identified during the Phase I survey within the Main Corridor Alternative route (Ezell, 2001). The areas within the Main Corridor Alternative that have a high to very high potential for buried archaeological deposits would be subject to further testing for the identification, evaluation, and treatment of eligible archaeological sites pursuant to Section 106 of the NHPA, should pole or structure locations fall within those areas.

Within Alternative Route Segment A, no currently listed or eligible for listing properties were identified during the Phase I archaeological survey (Ezell, 2001). However, the geomorphologic survey identified portions of the route that have a very high potential for buried archaeological deposits. Should the proposed project utilize Alternative Route Segment A and should it consequently not be feasible to avoid these deposits (should pole or structure locations fall within those areas), then these areas would be subject to further testing for the identification, evaluation, and treatment of eligible archaeological sites pursuant to Section 106 of the NHPA.

Within Alternative Route Segments B and C, none of the archaeological sites identified are eligible for listing within the NRHP (Ezell, 2001). The areas within Alternative Route Segments B and C that have a high to very high potential for buried archaeological deposits would be subject to further testing for the identification, evaluation, and treatment of eligible archaeological sites pursuant to Section 106 of the NHPA, should pole or structure locations fall within those areas.

Within Alternative Route Segment D, no currently listed or eligible for listing properties were identified during the Phase I archaeological survey (Barrett, 2003), and no locations in this alternate route segment were identified with a potential for buried deposits.

Within the North and South Mack Hatcher Alternatives, no currently listed or eligible for listing properties were identified during the Phase I archaeological survey (TRC, 2004), and no areas located in these alternative routes were identified with a potential for buried deposits.

4.3.11.2. Historic Structures

The historic and architectural survey (Karpynek, 2003a) identified 29 individual properties and 1 historic district within the project's proposed right-of-way and/or viewshed. TVA's survey report and determination of adverse effect were submitted to the Tennessee SHPO on January 24, 2003. Subsequent to this consultation, TVA considered three additional alternative routes (Route Segment D, North Mack Hatcher Alternative, and South Mack Hatcher Alternative). On July 2, 2004, TVA submitted a determination of adverse effect for the undertaking. The Tennessee SHPO concurred with TVA's finding and determination of adverse effect (see Table 3-1). Of these 30 identified properties, 18 are listed in the NRHP or are eligible for listing. Although 13 individual properties would be visually affected by the Main Corridor or its proposed alternative transmission line routes, the effects to 11 of these properties would not be adverse. Two of the individual properties could be adversely affected: WM-1150 by Alternative Route Segment C and WM-57 by the Main Corridor Alternative or Alternative Route Segment B.

Construction of the proposed transmission line on the preferred South Mack Hatcher Alternative route or any of the proposed alternative routes or segments would have an adverse effect on the HRHD. TVA, in consultation with the Tennessee SHPO has agreed to develop and execute an MOA to address the adverse effects identified in TVA's survey report and determination of adverse effect. The MOA would stipulate the development and implementation of a visual treatment plan to minimize and mitigate the visual effects both to individual contributing resources and to the agricultural characteristics for which the district is eligible. One measure to reduce the visual effects that TVA would implement is to paint the transmission line structures Franklin green, a dark color that would allow the structures to better blend with the rural setting. Additional avoidance measures would include the following:

- Single-pole steel structures would be used where feasible within the boundaries of the HRHD and within the viewsheds of historic structures.
- Alterations (i.e., structure height, span distance) within the preferred transmission line route to minimize its effects on a sensitive area of the district, a specific historic structure, or any other contributing resource would be implemented whenever prudent and feasible.

Under the terms and stipulations of an MOA, adverse effects on historic properties would be mitigated. The Tennessee SHPO concurred, in their letter dated July 14, 2004, that TVA's proposed mitigation appeared to resolve the project's adverse effects to the HRHD. TVA, in consultation with the SHPO and other consulting parties, will develop and execute an MOA for the identification, evaluation, and treatment of adverse effects. Under the terms of the MOA, adverse cumulative effects on historic properties would be mitigated and, therefore, would not be considered significant.

4.4. Post Construction Impacts

4.4.1. Electric and Magnetic Fields

TVA recognizes there is public concern about whether any adverse health effects are caused by electric and magnetic fields (EMF) that result from generation, transmission, distribution, and use of electricity. Many scientific research efforts and other studies examining the potential health and other effects of EMF have been and are being done.

TVA is aware of, and ensures that it stays aware of, published research and study results and directly supports some of the research and study efforts.

Studies, interpretations, and research to date are far from conclusive about potential associations between EMF and possible health impacts. A few studies have been interpreted as suggesting a weak statistical relationship between EMF and some rare forms of cancers. During the summer of 2001, the International Association for Research on Cancer reviewed available epidemiological studies and concluded that childhood leukemia appears to be associated with magnetic fields, but there was not a cause and effect relationship. It was concluded that the risk is small but may in some circumstances of higher exposure result in one type of childhood leukemia. The association also concluded that electric fields do not have an association with cancer.

However, equal or greater numbers of similar studies show no association or cannot reproduce data interpreted as demonstrating an association. No laboratory research has found cause and effect health impacts from EMF and certainly none that are adverse. Neither has any concept of how these fields could cause health effects achieved scientific consensus.

There is also no agreement in the scientific or EMF research communities as to what if any electric or magnetic field parameters might be associated with potential health effects. There are no scientifically or medically defined safe or unsafe field strengths, although state regulatory bodies in Florida and New York have established edge of right-of-way magnetic-field-strength limits for 230-kV and larger power transmission lines.

TVA has analyzed and continues to analyze the fields associated with its typical line designs using the best available models and has measured actual fields for a large number of locations along its transmission line easements. Both model data and measurements show that the field strengths for TVA transmission lines are well within Florida and New York limits. Based on such models, expected field strengths for the proposed lines discussed in this document would also be within those existing state guidelines.

TVA's standard location practice has the effect of minimizing continuous public exposures to transmission line EMF. The transmission line route selection team uses a constraint model that place a 300-foot radius buffer around occupied buildings, except schools, for which a 1200-foot buffer is used. The purpose of these buffers is to reduce potential land use conflicts with yard trees, outbuildings, and ancillary facilities and potential visual impacts as well as exposures to EMF. Although not absolute location constraints, these buffers weigh heavily in location decisions, influencing selection of route options and alignments. Because EMF diminishes quickly with distance from the conductors, the routing of transmission lines using constraint buffers effectively reduces potential continuous public exposure to EMF. Crossing under lines or otherwise being near them for short periods may increase overall EMF exposure but only minutely.

4.4.2. Other Impacts

No significant impacts are expected to result from the relatively short-term activities of construction, such as noise and solid waste disposal. Appendixes IV and V contain procedures for dealing with these issues.

4.5. Irreversible and Irretrievable Commitment of Resources

The materials used for construction of the proposed facilities would be committed for the life of the facilities. Some materials, such as ceramic insulators and concrete foundations, may be irrevocably committed, but the metals used in equipment, conductors, and supporting steel structures could be recycled. The useful life of steel pole transmission structures is expected to be at least 60 years.

The rights-of-way used for the transmission lines would not be irreversibly committed and could be returned to other uses upon retirement of the line. In the interim, compatible uses of the right-of-way could continue.

Forest products and related wildlife that might have grown on the presently forested portions of the right-of-way would be lost for the life of the project. No locally or regionally significant lost forest or agricultural production would be expected.

4.6. Unavoidable Adverse Effects

Clearing for this transmission line would result in the removal of less than 10 acres of forest. After completion of the transmission line, trees would not be permitted to grow within the right-of-way or to a determined height adjacent to the right-of-way that would endanger the transmission line.

Clearing and construction would result in the disruption of some wildlife, but no permanent habitat changes would occur except in the wooded areas previously described.

Any burning of cleared material would result in some, short-term air pollution.

Clearing, tree removal, and excavation for pole erection would result in a small amount of localized siltation.

Transmission line visibility would be minimized through the location and use of dark-colored structures; however, there would be some alteration of the visual character of the project area.

4.7. Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The construction and operation of the proposed transmission line would supply electricity to MTEMC's planned substation and would help maintain reliable electric service in the western portion of Williamson County. This would be accomplished by a localized shift of a small amount of land to use for electric power transmission. If, during the useful life of the transmission line, it is no longer needed or technology renders it obsolete, it can be removed with relatively little difficulty. The land encumbered by the right-of-way could be returned to its previous use or used for other purposes.

The principal change in short-term use of the right-of-way would be the exclusion of trees and permanent structures. The amount of forest being lost is small, less than 10 acres (as previously stated) within the right-of-way area, and areas removed from production are dispersed along the length of the transmission line. The right-of-way cannot support

building construction for the life of the project, but the social and economic benefits of the project should outweigh this small loss.

4.8. Summary of TVA Commitments and Proposed Mitigation Measures

To support the preceding conclusions TVA would commit to the following additional actions to avoid or mitigate possible environmental impacts:

Protection of Aquatic Resources and Water Quality

- All intermittent and perennial watercourse crossings would be designated as Level B, Protection of Important Permanent Streams, as outlined in Muncy (1999). This commitment restricts the cutting of trees near permanent streams to those meeting National Electric Safety Code and danger tree requirements and includes consultation with TVA biologists to minimize further the potential impact of stream crossings.
- Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances or ephemeral streams) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed to minimize erosion and subsequent sedimentation in streams.
- TVA stream bank stabilization experts would implement an erosion control plan to stabilize each watercourse crossing (Appendix X).
- TVA botanists would provide recommendations on planting native, low-growing, deciduous, and/or scrub/shrub vegetation on the stream banks to provide bank stabilization and a certain degree of canopy cover.
- TVA's maintenance organization would be informed that future maintenance activities are to minimize disturbance of any stream bank stabilization components or planted vegetation. In addition, future maintenance/sensitive area projects associated with the proposed transmission line would be reviewed by an aquatic ecologist to help ensure that aquatic life is not impacted by sedimentation due to embankment erosion related to maintenance activities.

General Best Management Practices for Clearing, Construction, and Maintenance

- TVA practices detailed in Appendixes IV, V, VI, and VII would be used during clearing, construction, and maintenance. EO 13112 directs all Federal agencies to prevent and control the introduction and spread of invasive species resulting from their activities. TVA would use reseeding mixes that are certified free of invasive, exotic plant seeds when replanting disturbed areas.

Protection of Historical Resources

- TVA would implement the MOA signed and executed by TVA and the Tennessee SHPO on October 1, 2004.
- Transmission line structures and associated hardware for this project would be painted or otherwise be colored "Franklin green," a mixture of black and green, to minimize visual effects further.

- If any eligible identified or inadvertently discovered archaeological sites would be traversed by heavy equipment, low ground-pressure-type equipment would be used when soil conditions are dry and firm.
- If at all feasible, no structures would be located within the boundaries of the eligible identified or inadvertently discovered archaeological sites.
- If avoidance is not feasible, these areas would be subject to further evaluation, and TVA, in consultation with the Tennessee SHPO and other consulting parties, would develop and implement a treatment plan for archaeological data recovery for those portions of the site that would be adversely affected under the terms of an MOA pursuant to Section 106 of the NHPA.
- Single-pole steel structures would be used where feasible within the boundaries of the HRHD and within the viewsheds of historic structures.
- Alterations (i.e., structure height, span distance) within the preferred transmission line route to minimize its effects on a sensitive area of the district, a specific historic structure, or any other contributing resource would be implemented whenever prudent and feasible.